Testing of Mercury Control with Calcium-Based Sorbents and Oxidizing Agents

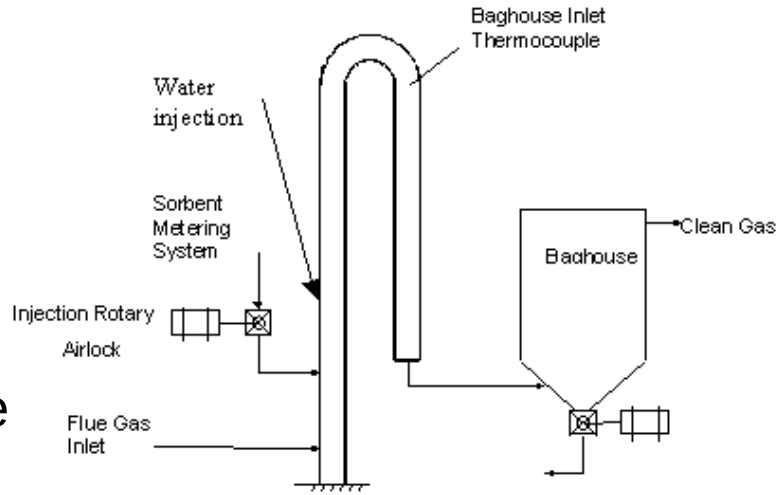
Southern Research Institute, Birmingham, Alabama

Subcontractor- ARCADIS Geraghty & Miller

Two test series performed:

1. ARCADIS Geraghty & Miller sorbents
2. Hydrated lime

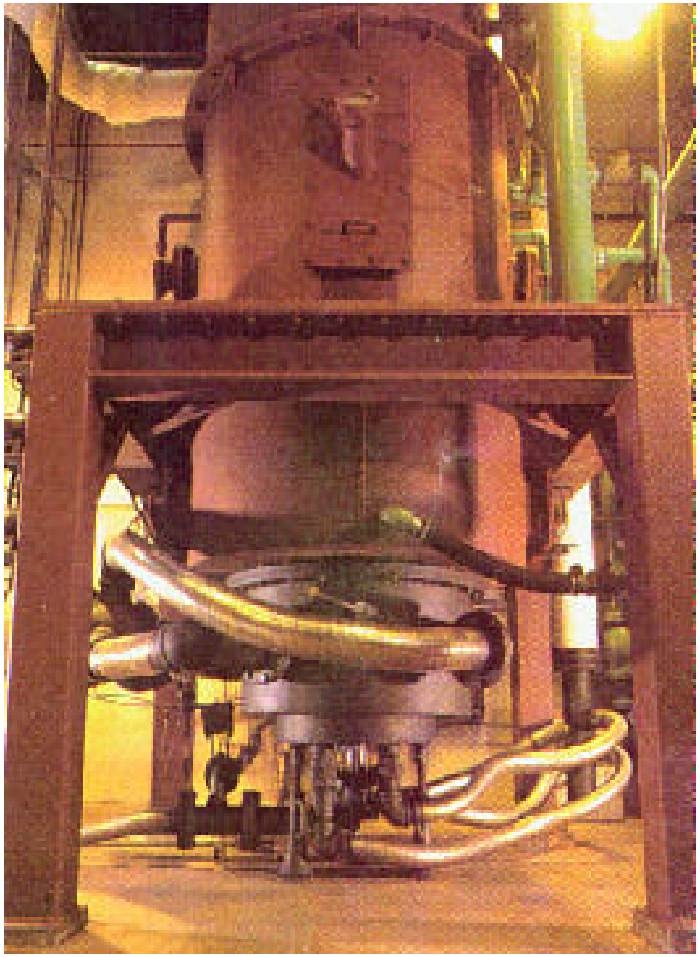
Bituminous coal with pulse jet baghouse



Calcium Sorbents

- Developed and prepared by Arcadis Geraghty Miller with EPA support.
- Hydrated Lime and Silica-lime (higher surface area) with an added oxidant.
- Bench-scale results showed adsorption capacity similar to activated carbon.
- Also capable of removing SO_2.
- Less expensive than activated carbon.

Combustion Research Facility
pilot scale furnace



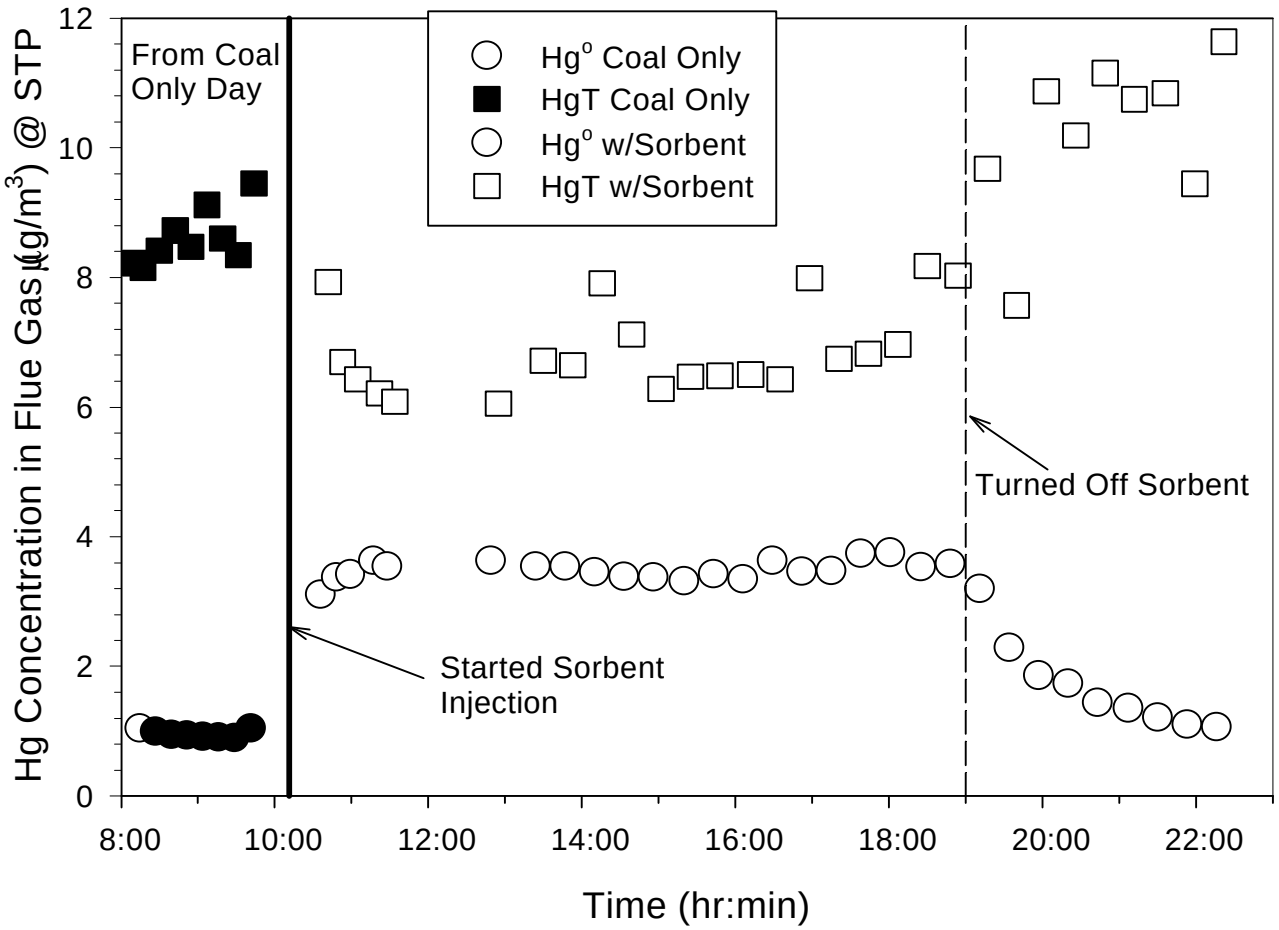
6 MBtu/hr pulverized coal

- (0.6 MW electric)
- pulse jet baghouse

Available but not used:

- fluidized bed for sorbent
- ESP for particulate control

PSA mercury monitor results of injection of hydrated lime+oxidant
Downstream of baghouse



Note decrease in total Hg but increase in elemental Hg (oxidant did not work)

Results of AGM Sorbents

	INLET	OUTLET No Sorbent			OUTLET Lime+oxidant			OUTLET Silica-lime +oxidant		
	PSA	PSA	OH	%Removed	PSA	OH	%Removed	PSA	OH	%Removed
Total Mercury ug/m^3	10-12	8-10	9.5	**14**	6-8	7.3	**34**	4-7	6.1	**45**
Elemental Mercury ug/m^3	4	1	1.2	**70**	4	4.9	**-22**	2-3	3.5	**12**

INLET=duct prior to sorbent injection, OUTLET=after baghouse
PSA=continuous emissions monitor, OH=Ontario Hydro method
Note that oxidant addition actually decreased amount of oxidized Hg relative to the oxidation that was occurring on the ash in the baghouse
Up to 45% Hg capture, up to 70% SO_2 capture

Results from hydrated lime injection

	INLET	OUTLET No Lime	OUTLET Lime
Total Mercury ug/m^3	14.5-16.5	8.5-10.5	2-4
Elemental Mercury ug/m^3	4	0.5	0

80-90% Hg removal

~50% SO_2 removal at higher injection temperature

Benchscale Results

- Designed to explain pilot scale results.
- Variables: Temperature 80 C or 140 C; sorbent, ash, NO, and CO present or absent.
- Found high temperature beneficial (contrary to expected Hg adsorption behavior, due to enhanced Hg oxidation, which adsorbs better).
- NO decreased sorbent performance by 71% at 140 C.
- **Conclusion**: Poor pilot scale results explained by presence of NO and lower temperature.

Future Direction

-Lime-based sorbents

-Alternative oxidants

- sodium tetra-sulfide
- chlorine compounds
- high iron oxide coal ash

-Lower rank coals (PRB)